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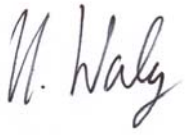

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Investigating the Monetary Policy of Central Banks with Assessment Indicators*

Marcel Bluhm[1]

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Abstract:
This paper outlines a new method for using qualitative information to analyze the monetary policy strategy of central banks. Quantitative assessment indicators that are extracted from a central bank's public statements via the balance statistic approach are employed to estimate a Taylor-type rule. This procedure allows to directly capture a policymaker's assessments of macroeconomic variables that are relevant for its decision making process. As an application of the proposed method the monetary policy of the Bundesbank is re-investigated with a new dataset. One distinctive feature of the Bundesbank's strategy consisted of targeting growth in monetary aggregates. The analysis using the proposed method provides evidence that the Bundesbank indeed took into consideration monetary aggregates but also real economic activity and inflation developments in its monetary policy strategy since 1975.

JEL Classification: E52, E58, N14

Keywords: Monetary Policy Rule, Statement Indicators, Bundesbank, Monetary Targeting

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1 Introduction

Empirical analyses of monetary policy are usually characterized by estimating interest rate rules which express the central bank's policy rate as a function of data on macroeconomic variables. One strand of literature in this field uses qualitative information to capture a policymaker's assessments of macroeconomic variables that are important for its decision making process.[1] The analysis in this chapter extends that literature and outlines how quantitative assessment indicators that are generated from a central bank's statements about economic and monetary developments can be used to estimate a monetary policy rule.

The information contained in a policymaker's assessment of macroeconomic variables is not available when estimating monetary policy rules only as a function of these variables, the policymaker's assessment of a variable differs from the numerical value of that variable. For example, a policymaker might think that a shock to variables that play an important role for its monetary policy, such as the inflation rate, is of temporary nature only. In this case the shock will not be attributed much weight in the central bank's monetary policy decisions. In contrast, if a policymaker judges the shock to be of permanent nature its actions are likely to be shaped (partly) in response to the shock. The central bank will take decisions depending on its assessment of the shock and communicate both, decision and its underlying motivation, to the public.

Through transparency and communication central banks achieve an understanding of their monetary policy decisions in the public which not at least improves the efficiency of their monetary policy. Since for this reason most central banks regularly explain and communicate their monetary policy decisions it offers the possibility to use this information for an analysis of their monetary policy. To capture this information about variables that are important for its decision making process, such as, for example, real economic activity, a central bank's public statements obtained from its regular economic statistical bulletin can be collected and used. The approach proposed in this chapter consists, in a first step, of assigning these statements ordinal index marks which depend on whether the statement is indicative of an (i) upward, (ii) downward or (iii) no deviation of the variables of interest from trend. In a second step these ordinally indexed statements are then transformed with the balance statistic approach into quantitative assessment indicators, which can be used for statistical analysis.

As an application of the proposed method a new dataset that allows to

[1] For a general review of Taylor-type rules see Orphanides (1998).

re-examine the monetary policy strategy of the Bundesbank is set up. The Bundesbank's monetary policy continues to be considered as a benchmark for many central banks in light of the Bundesbank's success in maintaining price stability. One distinctive feature of its strategy was the targeting of growth in monetary aggregates. However, this notion has been challenged by Clarida, Gali, and Gertler (1998) as well as Bernanke and Mihov (1997) who find monetary aggregates to be statistically insignificant when estimating Taylor-type rules for the Bundesbank. Using the assessment indicators approach for analyzing the monetary policy of the Bundesbank provides evidence that the Bundesbank indeed took into consideration monetary aggregates but also real economic activity and inflation developments in its monetary policy strategy since 1975.

The remainder of the chapter is organized as follows: Section 2 reviews the existing literature. Section 3 describes the construction of assessment indicators and Section 4 provides an analysis of the Bundesbank's monetary policy using the proposed method. Section 5 concludes.

2 Review of Previous Literature

The usefulness of qualitative information to investigate a central bank's monetary policy has been presented in numerous analyses. In a related article Gerlach (2007) constructs quantitative indicators of the ECB Governing Council's assessments of economic conditions to analyze its interest rate decisions and finds that the ECB did not react to temporary inflation shocks but to economic activity because it influences the outlook for inflation. Furthermore, the Eidgenössische Technische Hochschule Zürich (2007) sets up an indicator that captures the ECB president's statements concerning risks to price stability. The statements are translated into an index that contains information about the future path of monetary policy of the ECB. Using that index, Lamla and Rupprecht (2006) find that the ECB communication affects the term structure in the medium term and provide evidence that the ECB's forecasts of price developments and interpretations are important news for the markets. Sturm and de Haan (2009), also using the index and four additional qualitative information indicators[2] analyse whether communication by the ECB offers additional information as compared to the information content in standard Taylor rules. They provide evidence that the indicators indeed contain additional information that helps predict future policy

[2]The four additional communication indicators are (i) an updated version of the Rosa and Verga (2007) index, (ii) the index of Heinemann and Ullrich (2007), (iii) the aggregate index of Berger, de Haan, and Sturm (2006), and (iv) the indicator of Ullrich (2008).

decisions from the ECB.

Heinemann and Ullrich (2007) analyse the information content of ECB statements during monthly press conferences and show that including an indicator for signal words can improve a model's fit when added to standard explanatory variables in a Taylor rule. Berger, de Haan, and Sturm (2006) analyse the role of money in the ECB monetary policy using qualitative information from the introductory statements of the ECB monthly press conferences. The authors find that the indicator of the monetary policy only plays a minor role in the ECB's interest rate decision. Rosa and Verga (2005) analyze to what extent markets react to the information of the ECB released during its press conferences. Translating the qualitative information of the press conferences into an ordinal scale they find that the public understands and believes in the signals sent by the ECB.

Hansen and De Haan (2010) examine whether ECB statements on the main refinancing rate and future inflation are significantly related to interest rate decisions. In an out-of-sample evaluation they show that communication based models do not outperform models based on macroeconomic data in predicting policy rate decisions. Hayo, Kutan, and Neuenkirch (2008) study the effect of Federal Open Market Commitee (FOMC) communication on U.S. financial markets. The authors find that more formal communication channels such as monetary policy reports have a higher impact on financial markets' return and volatility.

Hayo and Neuenkirch (2009) use a Taylor rule augmented with Federal reserve communication indicators and find that including the communication indicators significantly improves explanatory power for interest rate decisions in and out of sample. Pakko (2005) analyses the predictive content of U.S. FOMC statements containing information about a subsequent tightening or easing of monetary policy. Using a Taylor rule framework he provides evidence that these statements are usefull for forecasting changes in the federal funds target.

In a broader sense this paper is also related to the so-called 'narrative approach' - the identification of monetary shocks through non-statistical procedures. This literature involves historical records that contain information about the motives that led to decisions by monetary authorities. For example, Romer and Romer (2004) use quantitative and narrative records to infer the Federal Reserve's intention for its target rate and find that monetary policy decisions by the Federal Reserve had large and rapid effects on output and inflation.

In the next section the method of constructing assessment indicators to capture qualitative information from a central bank's statements proposed in this paper is outlined.

3 Construction of Assessment Indicators

Transparency and accountability have become central elements in the statute of most central banks.[3] Not at least to counterbalance the assigned independence, they have to justify their policy decisions vis-à-vis the public and outline to which extent they achieve the assigned policy objective. Central banks communicate this information, for example, via giving press conferences, organizing research conferences, publicizing minutes of internal meetings, and issuing economic statistical bulletins. At the same time these communication channels offer central banks the opportunity to influence expectations and thereby the opportunity of more efficiently implementing their monetary policy.[4] The information captured in a central bank's communication hence offers an important point of departure for analyzing their monetary policy.

Among the outlined communication channels, economic statistical bulletins have an outstanding position. For example, the ECB's monthly bulletin is described to be its "communication flagship".[5] To enhance the public understanding of monetary policy, economic statistical bulletins contain "some descriptive commentary and analysis that go beyond data dissemination".[6] Most central bank's bulletins consist of a statistical section with economic key figures and a section in which these key figures are interpreted with respect to the overall economic situation, and in light of the monetary policy decisions taken by the central bank. In addition they contain articles covering a broad range of topics related to economic questions that help foster a deeper understanding of the economy and contribute to the academic debate. The proposed method in this paper uses the information conveyed by a central bank's assessment of macroeconomic variables based on the statements given in its periodic economic statistical bulletins.[7]

[3] For an overview on the importance of transparency and accountability for central banks see, for example, Eijffinger and Hoeberichts (2002) or Hahn (2002). For a theoretical and empirical analysis on transparency see, for example, Faust and Svensson (2001) and Eijffinger and Geraats (2006), respectively. Blinder, Ehrmann, Fratzscher, de Haan, and Jansen (2008) give a survey on the communication channel and show that it has become increasingly important for the conduct of monetary policy. In particular they find that central bank communication can move financial markets and makes monetary policy decisions more predictable. Amato, Morris, and Shin (2002) explore the economic effects of public information in monetary policy and find that it is very effective in influencing agents, however, that there is also a danger if agents only rely on that channel to coordinate actions away from fundamentals.

[4] On the importance of expectation formation for the conduct of monetary policy, see, for example, Demertzis (2006).

[5] Issing (2008), p. 74.

[6] Dyiobek and Jin (2002), p. 2.

[7] It is straightforward to extend the coverage of assessment indicators outlined in this

The following subsection outlines how statements are selected from economic statistical bulletins and assigned to prespecified categories that are relevant for a central bank's monetary policy decisions.

3.1 The Statement Data Set

Prior to capturing information from statements, different categories that will serve to group the statements have to be specified. One possibility to determine potential categories for grouping the statements is to use the structure of the analyzed economic statistical bulletin. The structure of analysis in a central bank's monthly bulletin gives an important indication as to which areas are important for its monetary policy decisions. For example, the ECB structures its analyses in the monthly bulletins into the categories 'the external environment of the euro area', 'monetary and financial developments', 'prices and costs', 'output demand and the labour market', and 'exchange rate and balance of payments developments'. The Bundesbank subdivided its analyses into 'monetary developments', 'securities markets', 'public finances', 'economic situation' and 'balance of payments'. The Swiss National Bank structures its analyses in the quarterly monetary policy reports into the categories 'developments in the global economy', 'developments in the Swiss economy', 'monetary developments', and 'SNB inflation forecast'. Another possibility to determine potential categories is to refer to standard variables used in the estimation of monetary policy rules such as 'real activity' to group statements that allow inference about the output gap, and 'price activity' to get an indication about the deviation of inflation from target.

After having identified the categories used in the analysis of the central bank's monetary policy, the next step consists of identifying and collecting statements in which the central bank assesses (part of) these categories. Statements in economic statistical bulletins very often do not touch directly upon a specified category but instead assess key-variables from the defined category. For example, a category 'real activity' could be assessed, inter alia, with variables like 'investment', 'industrial production', and 'employment'. Each statement about a key-variable gives a hint as to how the central bank assesses (part of) the information that is available about the state in the according category at the time the assessment is given.

Assessments might refer to variables' past developments or their expected developments in the future. Central banks often refer to past values of variables because the numbers provided by the statistical offices are mainly avail-

paper beyond capturing information from economic statistical bulletins only, for example, via using statements given during press conferences, interviews etc.

able with a certain time lag. However, all variables evaluated in a defined category reflect the motives for the central bank's monetary policy decisions at the time the assessment is given, that is, i t and will thus be used in the following to set up the assessment indicators for each category in t.

At this stage of analysis one has available for each point in time, that is for each issue of the economic statistical bulletin of the analyzed central bank, numerous statements for each category.

The next subsection outlines how an ordinal index mark can be assigned to each of the collected statements.

3.2 The Index

To reduce arbitrariness in the evaluation of statements the procedure outlined in the following only uses three option ordinal index numbers and confines evidence containing information about changes in the monetary policy stance to the occurrence of key-words. When assigning ordinal index numbers to the collected statements it is important (i) to determine whether a statement's subject variable is out-of-trend (deviates from its normally expected value), and if so (ii) whether the variable has positive or negative influence on the category (is positively or negatively correlated with the category) it is assigned to. The following paragraph outlines when a variable should be judged out-of-trend and how its influence on the according category can be determined.

Statements using key-words that put emphasis on the central bank's assessment of the variable under consideration, for example, 'high', 'weak', 'markedly', 'extraordinarily', or alike, indicate that the variable under consideration is out-of-trend. To find out whether a variable is positively or negatively correlated with the according category one needs to determine under which circumstances the category deviates – positively or negatively – from trend. For example, it is sensible to define the category 'real activity' to positively (negatively) deviate from trend if economic activity is higher (lower) than normally expected by the policymaker. The influence of a variable on the according category depends on whether the variable's deviation from trend influences the category it is assigned to into the same direction (positive influence) or into the opposite direction (negative influence). For example, the variable 'unemployment rate' has negative influence on the category 'real activity' if the category is defined as suggested above. Higher than normal unemployment indicates that the economy underperforms. In contrast, the influence of the variable 'industrial production' on the category 'real activity' is then positive because high industrial production indicates that the real economy is used to capacity. Having outlined the relation be-

tween variables and their according category the scheme depicted on Figure 1 shows, how each statement is assigned an ordinal index mark.

First of all, one infers following the approach described in the previous paragraph whether a statement suggests that its subject variable is out-of-trend. If a statement is not judged to be out-of-trend it is assigned a '0' in the according category [case A]. If the statement suggests that the variable deviates from its normal state one has to figure out the variable's influence on the according category. The statement is assigned a '1' ('−1') [case E(D)] if the variable positively deviates from its normal state and has positive (negative) influence on the category. The statement is assigned a '−1' ('1') [case C(B)] if the variable negatively deviates from its normal state and its influence on the according category is positive (negative). In the following the evaluations '1' and '−1' are denominated out-of-trend marks and the categorized and evaluated set of statements will be referred to as ordinal index data. At this stage of setting up the assessment indicators, each category of the ordinal index data contains for each point in time many index numbers, taking on the values '-1', '0', or '1'.

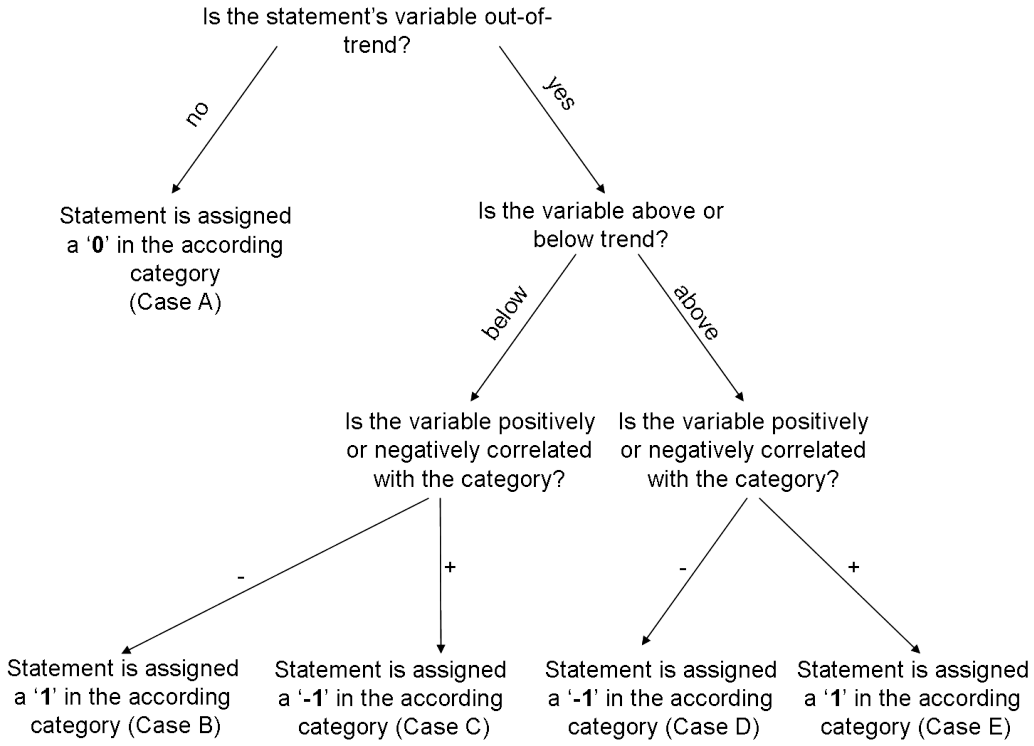


Figure 1: Assignement of Index Marks

The next subsection describes the method that is used to transform the

ordinal index data into quantitative assessment indicators.

3.3 Transformation of the Index Into Assessment Indicators

The ordinal index data have arranged the central bank's assessments of unobservable indicators like 'real activity' in an accessible way. In the following, each individual index number is treated analogeously to a response of the central bank under consideration to a question about its assessment of the state in the according category. This approach offers the possibility to transform the ordinal index data into quantitative assessment indicators with techniques known from public survey analyses.

Surveys are an important source to measure expectations – or, as in the case of this analysis, assessments – directly and offer up-to-date information about the state of the economy. They can be broadly divided into two classes, namely quantitative and qualitative surveys.[8] Quantitative surveys require precise quantitative answers. An example is the ECB's Quarterly Survey of Professional Forecasters which, inter alia, asks the participants for point estimates of Euro Area inflation expectations.[9] In contrast, qualitative surveys do not directly ask the respondents for a precise figure concerning the variable under consideration. Instead respondents are asked to give a qualitative indication. The latter is widely used in surveys because responses to qualitative questions are more reliable than more precise questions, there is believed to be some sort of trade-off between the loss of information consequent on qualitative questions and the cost in terms of response rate and therefore possible bias from asking more precise questions.[10]

A special form of qualitative survey is the business tendency survey which asks respondents about recent developments and the current situation of their business as well as about their plans and expectations for the near future. One example for this kind of survey is the Industrial Confidence Indicator published by the European Commission.[11] For example, repondents are asked whether they consider their current stock of finished products to be 'too large (above normal)', 'adequate (normal)', or 'too small (below normal)'. Another question asks respondents whether they expect their production to 'increase', 'remain unchanged', or 'decrease' over the next 3 months. The ordinal index data described in the previous subsection are set up in the spirit of such a tendency survey as they also consist of three-option replies. The ordinal

[8] Pesaran (1987)

[9] Garcia (2003)

[10] Pesaran and Weale (2005)

[11] An overview on the methodology of the Confidence Indicators used by the European Commission is given in European Commission, DG for Economic and Financial Affairs (2007).

index numbers assigned can be based on statements related to levels as well as to changes of relevant variables.

There exist mainly three approaches to convert qualitative survey data into quantitative data: The balance statistic approach, the regression approach and the Carlson-Parkin method.[12] While the latter two are rather complex and based on distributional assumptions, the balance statistic approach is not outperformed as there is a very high correlation between all three approaches when three-option replies are used.[13] The European Commission, for example, makes use of the balance statistic to set up the Industrial Confidence Indicator. The balance statistic is also the method of choice used in this paper to transform the ordinal index data into time series of quantitative assessment indicators. It is calculated as follows:

$$bs_{jt} = u_{jt} - d_{jt} \tag{1}$$

where

- bs_{jt} denotes the balance statistic in category j at time t,
- u_{jt} denotes the proportion of statements that indicate a positive deviation from trend in category j at time t, and
- d_{jt} denotes the proportion of statements that indicate a negative deviation from trend in category j at time t.

Applying Equation 1 to the ordinal index data one obtains a quantitative assessment indicator restricted to the interval (-1,1) for each defined category at a point in time. If no statements are available in a category it is assumed that the assessment indicator is in line with trend, that is, the assessment indicator is assigned a value of '0'.

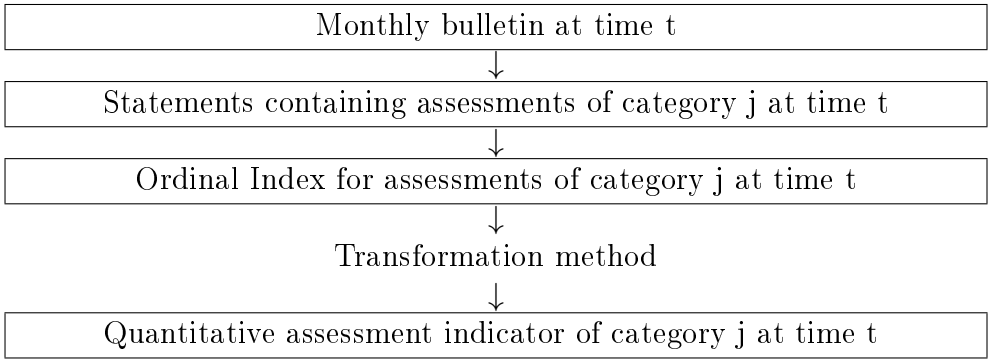
Note that the assessment indicators contain information about the central bank's assessment of past and currently available data as well as on its expectations about data in the future. The indicators obtained from this information set hence contain real time information available to the central bank at the time the assessment was given and are thus not subject to the informational problems outlined in Orphanides (2001). The information content in the assessment indicators is limited, not at least because the indicators are based on three-option replies and are restricted to the interval (-1,1). However, the more statements available for a category at a point in

[12] An overview about these transformation methods can be found in Pesaran and Weale (2005).

[13] OECD (2003)

time, the preciser will be the balance statistic. For example, if for a category at a point in time there is only one statement, the assessment indicator can take on three values, -1, 0, and 1. If instead there are two statements, the assessment indicator can additionally take on the values -0.5 and 0.5, etc.[14] Effectively, the informaton content in the assessment indicators gets less coarse if the number of statements in a category at a point in time increases. However, no matter how many discrete values the assessment indicators can take on, in tendency, they reveal the central bank's assessment of categories underlying its monetary policy decisions.[15]

Figure 2 gives an overview of the method outlined throughout this paper.



Where t covers the time dimension, and j denotes different specified categories.

Figure 2: Method to Generate Assessment Indicators

In the next section the monetary policy of the Bundesbank will be analyzed with the proposed method.

4 Analysis of the Bundesbank's Monetary Policy Using Assessment Indicators

The Bundesbank's monetary policy continues to be considered as a benchmark for many central banks in light of the Bundesbank's success in main-

[14]Hence the analysis of Gerlach (2007) with ordinal index values that can take on 5 distinct values can be seen as an example for the case where one collects exactly two statements for each category in each monthly bulletin analyzed.

[15]It is possible that the number of variables evaluated in a defined category varies between different issues of economic statistical bulletins if the central bank does not always receive data in time or if variables are only analysed from a certain point in time onward. For example, when growth in money funds became very large in the 1990s, the Bundesbank created a new monetary aggregate for analysis, 'M3 extended', that contained these funds.

taining price stability. One distinctive feature of its monetary policy was the strategy of monetary targeting which the Bundesbank officially followed since 1975. Whether monetary aggregates indeed played a role in the monetary policy strategy of the Bundesbank is subject to an ongoing debate. Analyses show mixed evidence. While Clarida, Gali, and Gertler (1998) find that monetary aggregates did not play a significant role for the Bundesbank's monetary policy from 1979 to 1993, Gerberding, Worms, and Seitz (2004) find that the Bundesbank indeed took its monetary targets seriously from 1979 to 1998 and Clausen and Meier (2005) find that monetary aggregates played a small but significant role for the Bundesbank's interest rate decisions between 1973 and 1998.

As an application of the method proposed in this paper the monetary policy strategy of the Bundesbank is re-examined using a new data set. The dataset consists of statements the Bundesbank gave in its monthly bulletins and is utilized to construct assessment indicators that capture the Bundesbank's assessment of monetary and real economic developments following the approach outlined in the previous section. These assessment indicators are then used to estimate a monetary policy rule.

This analysis might also be relevant for the debate about the two pillar strategy of the ECB. The ECB was established much in the spirit of the Bundesbank, also as regards the monetary policy strategy. Prior to the financial crisis that began in 2007 it has been subject to particular criticism for using monetary indicators in its second pillar to assess the trends in medium- to long-term inflation. If the Bundesbank actually was a monetary targeter its eminent track record concerning price stability might suggests that incorporating monetary aggregates in a central bank's policy strategy cannot be labelled as improper right away.

The following subsection outlines the monetary policy strategy of the Bundesbank.

4.1 The Bundesbank's Monetary Policy

The Bundesbank Act from 1957 mandated the Bundesbank to 'safeguard the currency' which ultimately was interpreted as maintaining price stability.[16] To achieve this goal, since 1975 the Bundesbank's policy consisted of pre-announcing annual targets for growth in broad money. From 1975 to 1987 the target was defined as the central bank monetary stock, that is, currency in circulation and required reserves, and from 1988 to 1998 the Bundesbank

[16] On several occasions the Bundesbank stated that price stability is its statutory final goal, for example, in Bundesbank (1995).

targeted the monetary aggregate M3. To cross-check and verify the information content provided by the money stock, the Bundesbank always included other monetary and real indicators in its monetary policy analyses. The monetary targeting strategy was implemented via controlling the quantity of money indirectly by influencing the day-to-day money market rate in the interbank market through rediscount and lombard policies, minimum reserve policy, and open market operations.[17]

The Bundesbank determined the money growth target for the following year via adding growth of potential output, the 'unavoidable' inflation over the medium term, and the trend rate of change in the velocity of money. The reasoning behind this approach was that if the money stock could be kept on this target path, the monetary conditions should be met for corresponding real growth to be compatible with monetary stability.[18] Although the Bundesbank announced the growth target on a yearly basis it frequently stressed the medium-term nature of the approach – the Bundesbank did not apply its monetary policy mechanically but accepted short-run deviations from target growth if neccessary. With a few technical modifications this approach has been followed since the start of this policy in 1975 although the Bundesbank regarded monetary targeting as an experiment in the first few years.[19]

Despite the fact that the Bundesbank attained only 13 of 24 money stock targets, it impressively achieved its ultimate goal of safeguarding price stability with an annual inflation rate of 3% on average between 1975 and 1998.[20]

The following subsection outlines how the assessment indicators for the Bundesbankare are set up.

4.2 Assessment Indicators for the Bundesbank

As outlined in Section 1.3, policy relevant statements can be extracted from the analyzed central bank's economic statistical bulletin. The monthly bulletin was the Bundesbank's main instrument of communication with the public. Prior to the emergence of European Monetary Union (EMU) the monthly bulletins of the Bundesbank had an outstanding position in Germany in the field of regular economic publications. Since 1970 the Bundesbank regularly incorporated economic reports in its monthly bulletins. Every quarter, two monthly bulletins contained abridged economic reports and one monthly bul-

[17] Bundesbank (1995)

[18] Issing (1997)

[19] Schmid (1999)

[20] Own calculation: Mean year-on-year percentage change of the consumer price index; from 1975 to 1991 only for West Germany, from 1992 to 1998 for re-united Germany.

letin gave a detailed report on the economic situation in Germany.[21] These parts of the monthly bulletin touched upon the different fields the Bundesbank judged to be of importance for its monetary policy. They were organized into subsections analyzing 'monetary development', 'public finances', 'economic situation', 'balance of payments', and 'stock and bond markets'. All monthly bulletins contained a statistical appendix with economic key data, and infrequently essays on economic questions of interest.

To construct the assessment indicators for the Bundebank, only the abridged reports and the editorials of the economic outlook in the monthly bulletins are taken into account because in these parts the Bundesbank explained its policy decisions in the context of its analyses of economic and monetary aspects in a condensed form. As the structure of the monthly bulletins had undergone only minor changes since January 1970 this date is chosen as the starting point of the sample analysed. The endpoint of the sample is December 1998 because it marks the last month of an independent monetary policy of the Bundesbank.

All statements from the abridged reports and the editorials of the monthly bulletins from 1970 to 1998 that assess one or several of the categories, 'monetary activity', 'real activity', 'fiscal activity', 'foreign trade activity', and 'price activity' have been collected.[22] Table 1 summarises the influence of the variables appearing most frequently in statements of the Bundesbank. The average number of assessed statements per month amounts to 8.63 for the category 'monetary activity', 8.68 for the category 'real activity', 5.89 for the category 'fiscal activity', 4.49 for the category 'foreign trade activity', and 2.41 for the category 'price activity'.

Several examples for the evaluation of statements are given in Appendix A at the end of this paper.

Following the proposed method outlined in the previous section, assessment indicators for the five defined categories are set up. As a showcase Figure 3 displays the assessment indicator for monetary activity, its mean value and the number of statements in each month. The time series shows little persistence and the number of statements assessed reflects that the editorials and short reports of the monthly bulletins became more extensive over the years. While the analysed parts covered only three to five pages in a bulletin in the 1970s, the amount of pages to be analysed at the end of the 1990s increased up to seven pages. This development took place gradually in the course of time. As previously outlined, this makes the assessment indica-

[21] The Bundesbank issued economic reports prior to 1970 but not on a regular monthly basis: within a year there were several issues of monthly bulletins containing only economic key-data.

[22] In the following these five fields will be referred to as categories.

Category	Variables Positively Correlated With the category	Variables Negatively Correlated With the category
Monetary activity	Monetary expansion Monetary inflows from abroad Volume of money in circulation Monetary aggregates Credits	Long-term deposits Monetary outflows to abroad
Real activity	Industrial production Investments Business cycle Labour market Economic activity Volume of orders Domestic orders	Unemployment
Fiscal activity	Public debt Public spending / investment Public borrowing Public deficit	Inland tax revenues
Foreign trade activity	Orders from abroad Exports Active trade balance Sales abroad	Inland orders for abroad Imports Passive trade balance
Price activity	Producer prices Year-on-year percentage change of the CPI Import prices	

Table 1: Variables and Their Relation to the Assessed Category

tors' information content less coarse for later issues of the monthly bulletins and provides a more differenciated picture of the Bundesbank's assessment about the economy. According figures for the assessment indicators of the other categories can be found in Appendix B at the end of this paper.

Theoretically, deviations from trend captured by the assessment indicators should be zero on average. However, the mean values of all assessment indicators are positive, ranging from 0.06 (foreign trade activity indicator) to 0.17 (monetary activity indicator). This might reflect higher vigilance of the Bundesbank towards upward risks to price stability as compared to downward risks if the Bundesbank did not assess upward or downward deviations from trend symmetrically. In other words, the Bundesbank might have perceived an upward deviation from trend in a category as sizeable because this puts upward pressure on prices while the Bundesbank might not have perceived a downward deviation of similar magnitude as sizeable if it was not as sensible as regards downward risks to price stability.

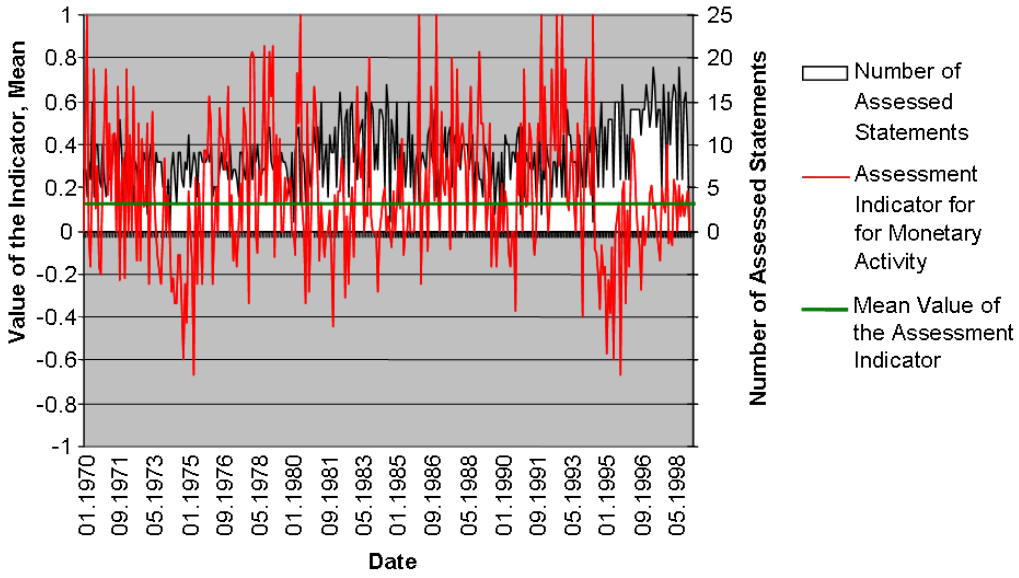


Figure 3: Assessment Indicator for Monetary Activity

Except for the real activity indicator and the fiscal activity indicator the assessment indicators are not correlated with each other. This gives evidence that the indicators capture distinct sets of information. The correlation coefficient between the real activity indicator and the fiscal activity indicator amounts to -0.30 which might be due to countercyclical policies of German governments. It is very likely that in addition to the normal stabilizers, deficit spending strategies were implemented when the economy was in a recession.

In the following subsection a monetary policy rule based on the outlined assessment indicators is estimated for the Bundesbank.

4.3 A Monetary Policy Rule for the Bundesbank

Investigating the properties of monetary policy rules, Levin, Wieland, and Williams (1998) show that first difference rules perform reasonably well in comparison to several alternatives and are robust to model uncertainty. In their analysis they employ the first differenced U.S. federal funds rate as dependent variable and a measure for the deviation of inflation from target and the output gap as independent variables. Other authors also use first difference rules to investigate the monetary policy of the Federal Reserve System of the U.S. or the ECB. For example, Judd and Rudebusch (1998) estimate a policy rule for the Fed with the U.S. federal funds rate in first differences as dependent variable and measures for the output gap and deviation of inflation from target as independent variables. Gerlach (2007) estimates a policy rule for the ECB using first differences of the repo rate as dependent variable, and different measures capturing real economic activity, inflation, money growth, and the exchange rate as independent variables.

To investigate the monetary policy of the Bundesbank, a Taylor-type rule will be estimated that explains the first differenced German day-to-day money market rate[23] with all generated assessment indicators following Equation (2).

$$\Delta i_t = c + \beta_1 \cdot money_t + \beta_2 \cdot real_t + \beta_3 \cdot fiscal_t + \beta_4 \cdot trade_t + \beta_5 \cdot price_t + \epsilon_t \quad (2)$$

where 'Δi' are the first differences of the German day-to-day money market rate (monthly averages), 'c' is a constant, 'money' denotes the deviation of monetary activity from trend and is captured by the assessment indicator for monetary activity, 'real' denotes the deviation of real activity from trend and is captured by the assessment indicator for real economic activity, 'fiscal' denotes the deviation of fiscal activity from trend and is captured by the assessment indicator for fiscal activity, 'trade' denotes the deviation of foreign trade activity from trend and is captured by the assessment indicator for foreign trade activity, 'price' denotes the deviation of price activity from trend and is captured by the assessment indicator for price activity, and 'ϵ' is an error term. To avoid a spurious regression it is important to determine the order of integration of the time series under consideration. All time series used are stationary at a 5% significance level when applying the Dickey-Fuller

[23] Clarida and Gertler (1996) use a vector autoregressive analysis to identify the German day-to-day money market rate as the relevant policy instrument of the Bundesbank as well as measures for inflation and output gaps as explanatory variables. Similarly, Clarida, Gali, and Gertler (1998) employ the German day-to-day money market rate as dependent variable in an estimation of a monetary policy rule for the Bundesbank, with inter alia measures for the output gap and deviation of inflation from target as explanatory variables.

test.[24]

Intuitively one would expect the coefficients of the explanatory variables in equation (2) to be positive since high values of the assessment indicators are indicative of upward risks to price stability.

The time span covered in the first analysis, January 1970 to 1998, might contain structural breaks, for example, the breakdown of the Bretton-Woods system in March 1973, the beginning of the monetary targeting strategy of the Bundesbank in January 1975, and German re-unification in October 1990. Bai and Perron (1998) propose a procedure that allows to estimate the number and the position of breakpoints and tests linear models with multiple structural changes for a given data set. In the following this method will be applied to the estimation of monetary policy rules for the Bundesbank to detect potential breakpoints in the sample. An outline of the procedure can be found in Appendix C at the end of this paper.

The procedure selects March 1975 as the only breakpoint.[25] Table 2 displays the estimation results for the two samples ranging from January 1970 to March 1975, and April 1975 to December 1998. Regarding the first sample, only the indicator for real activity is significant.[26] Given its coefficient, the target rate's first difference rose by 2.84 percentage points if, ceteris paribus, all variables from the category real activity were assessed to be above trend (that is, the according indicator has a value of 1). The relatively high coefficient estimates are likely due to the volatility of the dependent variable during the breakdown of the Bretton-Woods system. Figure 4 displays the day-to-day money market rate for the period of analysis. Several large changes took place only during and shortly after the period of Bretton-Woods.

Regarding the second sample, all assessment indicators except those for foreign trade activity and fiscal activity are significant and have the expected sign. If all assessments in one of the categories, monetary activity, real activity, or price activity, ceteris paribus, were assessed to be above trend, the day-to-day money market rate rose by 0.16, 0.22, or 0.19 percentage

[24]Note that the results as regards significance and breakpoint tests in the following also hold qualitatively when estimating the Taylor-type rules not as a first-difference rule but with the level of the day-to-day money market rate as dependent variable and as explanatory variables the lagged dependent variable as well as the assessment indicators. However, since the dependent variable features high persistence at a monthly frequency, it follows a unit root process.

[25]As a robustness check here and in the following the procedure has been implemented with several values of the parameter that determines the minimal length of a sub-sample. For reasonable values of this parameter the selected breakpoint is always March 1975 in the first analysis.

[26]Significance is indicated by an absolute t-value of 1.96 or larger. All t-statistics are computed with robust standard errors.

points, respectively.

Sample:	Jan 1970 - Mar 1975	Apr 1975 - Dec 1998
Constant	-0.61 [1.53]	-0.09 [3.22]
Monetary activity	-1.75 [1.41]	0.16 [2.09]
Real activity	2.84 [2.17]	0.22 [3.78]
Fiscal activity	1.65 [1.47]	0.05 [0.79]
Foreign trade activity	-0.46 [0.59]	0.09 [1.76]
Price activity	-0.25 [0.36]	0.19 [2.60]
No. of obs.	63	285
Adjusted R-squared	0.078	0.067

The dependent variable is the first difference of the day-to-day money market rate. Estimated equation:

$\Delta i_t = c + \beta_1 \cdot money_t + \beta_2 \cdot real_t + \beta_3 \cdot fiscal_t + \beta_4 \cdot trade_t + \beta_5 \cdot price_t + \epsilon_t$

Table 2: Regression Results of the Taylor Rule for the Bundesbank Using Only Assessment Indicators

A central result is the significance of the assessment indicator for monetary activity in the sample that starts in April 1975.[27] It provides evidence that the Bundesbank indeed took into account the development of monetary aggregates for the conduct of its monetary policy. The analysis does not allow to determine whether the Bundesbank directly influenced its target rate via setting its monetary policy instruments or indirectly via influencing market expectations through its communication within the framework of its monetary policy strategy.[28] However, monetary aggregates played a significant role in the practical implementation of the Bundesbank's monetary policy strategy. Similar to Gerberding, Worms, and Seitz (2004) and Clausen and

[27] The assessment indicators can also be used to augment standard Taylor-type rules, that is, monetary policy rules containing standard statistical data for the output gap and deviation of inflation from target. In the case of the Bundesbank the inclusion of the assessment indicators for price activity and monetary activity increases the fit of the model with respect to such a standard Taylor-type rule as measured by the adjusted R-squared. A systematic comparison of such hybrid rules would be interesting to pursue but is beyond the scope of this paper.

[28] For an analysis of the money growth targeting approach of the Bundesbank in light of a communication strategy see von Hagen (1999).

Meier (2005) the results also give evidence that the Bundesbank was not a pure monetary targeter but took into consideration real activity and inflation developments as well.

Besides the Bundesbank, several other central banks incorporated monetary targeting elements in their policy strategies – with different degrees of success. Switzerland successfully followed a strategy of monetary targeting from 1975 to 2000. The Federal Reserve System of the United States adhered to a policy strategy with monetary targeting elements at the beginning of the 1980's, and the Bank of England pursued a strategy that focused on monetary targeting at the end of the 1970's and in the 1980's. However, the latter two central banks more or less abandoned monetary targeting elements in their strategies after several years. In the United States a large literature has criticised the notion of monetary targeting because of the macroeconomic turbulence of that period and of the severity of the recession that followed.[29] The authors claim that accurate control of the money stock is not feasible or that control induces extreme volatility to money market rates. The practical implementation of the monetary targeting strategy followed by the Bundesbank might be a reason why criticism against monetary targeting do not convincingly apply in the case of the German experience. The Bundesbank never claimed to be able to completely control money growth and often missed its target growth rate. In large part this should be due to the medium-term orientation of the Bundesbank's strategy but also to a certain degree of pragmatism which is revealed by also taking real economic and inflation developments into consideration.

"*Some occasions when targets were missed may well be interpreted as showing that at these points in time the Bundesbank allowed itself additional room for discretion in the light of the then prevailing situation. Only rarely have money stock overshoots been of a completely involuntary nature; mostly rather they constituted deliberate monetary policy decisions. [...] Crucially though, monetary policy was always analyzed with a view to achieve the ultimate aim of safeguarding the currency. Such an approach may be termed 'pragmatic monetarism'...*"[30]

This also gives evidence why the pragmatic, flexible monetary targeting approach of the Bundesbank did not induce extreme volatility to money market rates. The Bundesbank did not mechanically try to achieve its medium target but claimed a certain discretionary margin when judged neccessary. Figure 4 displays that the Bundesbank did not bring extreme hikes or slumps

[29] McCallum (1985)

[30] Issing (1997). From 1990 to 1998 Otmar Issing was a member of the Board of the Deutsche Bundesbank with a seat in the Central Bank Council.

about its target rate since the start of monetary targeting in 1975.

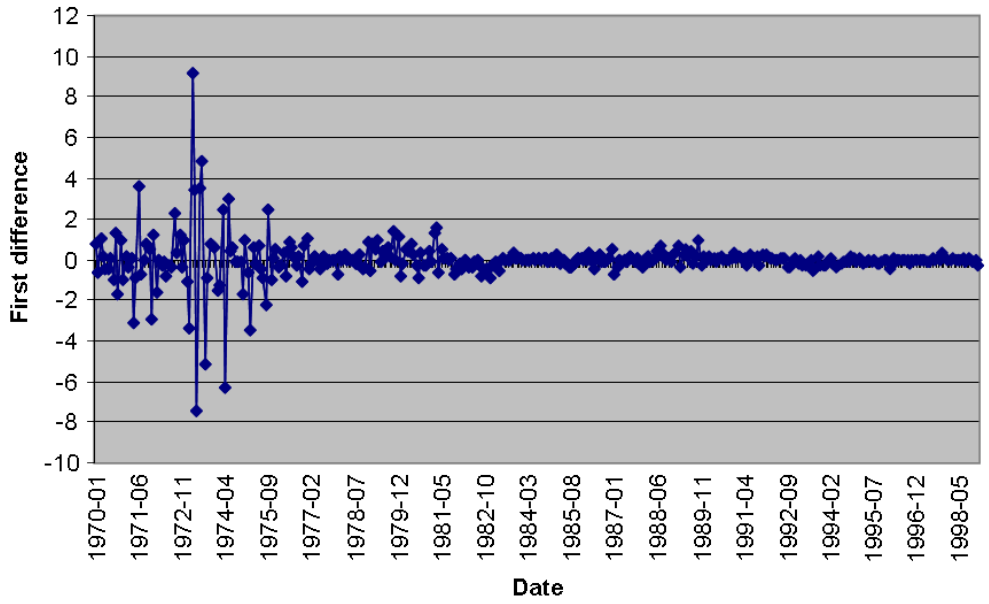


Figure 4: First Differences of the German Day-to-Day Money Market Rate (monthly averages)

Critics of monetary targeting also stress that practical difficulties coming up through technological changes and deregulations in the payment industry render monetary targeting practices unfeasible. These arguments do not apply in the German case as well. It is possible that money demand functions become unstable and that targeted monetary aggregates lose explanatory power and utility for forecasting. However, this was not the case for Germany as the liberalization of financial markets and cross-border money and capital movements was largely completed in Germany at the beginning of the 1970s. In addition, new financial products generally turned out to be of little relevance in Germany.[31]

The results of the analyses in this paper give evidence that the Bundesbank actually was a flexible monetary targeter. Its policy strategy was in large part operational due to a combination of the Bundesbank's pragmatic approach and to a relatively stable financial environment in Germany after the period of Bretton-Woods.

[31] Issing (1997)

5 Conclusion

This paper outlined a new method which allows to extract a central bank's assessment of macroeconomic key-variables from its public statements using the balance statistic approach. Since a central bank's assessment of key economic variables is not contained in the information set when using readily available statistical data such as, for example, inflation developments, the generated assessment indicators capture unique information and can be used to analyze a central bank's monetary policy.

The method is applied to re-investigate the Bundesbank's monetary policy strategy with a new data set and gives evidence that the Bundesbank actually was a flexible monetary targeter. When estimating a monetary policy rule with a sample ranging from April 1975 to December 1998 the assessment indicators for monetary activity, real activity, and price activity are significant and have the expected sign. Particularly for the monetary indicator this is an interesting result as it was claimed in several studies that the Bundesbank actually did not involve monetary aggregates in the conduct of its policy.

These results then indicate that the inclusion of monetary aggregates in a central bank's monetary policy strategy, as done by the ECB, might not be refuted as unreasonable right away. The example of the Bundesbank gives evidence that successfully incorporating monetary targeting elements in a policy strategy is possible.

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Appendix A: Examples for the Evaluation of Statements

First of all consider three examples for the category 'monetary activity'.

"*Das längerfristige Mittelaufkommen bei den Banken war [...] weit höher als gewöhnlich [...].*"[32]
The statement suffices to assign an out-of-trend mark as it describes the variable 'long-term deposits' to be much higher than usual. The influence of long-term deposits on monetary aggregates is negative. Accordingly the statement is evaluated with '-1' (Case D in Figure 1).
"*Deutlicher noch als in den vorangegangenen Monaten beruht das starke Wachstum der Geldmenge im Juni des Jahres auf der kräftigen Expansion der Kreditgewährung der Banken an inländische Kunden.*"[33]
This statement assesses two variables: 'monetary quantity' and 'credits'. Both variables change sizeably into a positive direction. As the variables are positively correlated with the category both are evaluated with '1' (Case E in Figure 1).
"Insgesamt waren die Kredite [...] an inländischen Nichtbanken Ende Juli 1970 um 12.8 Prozent höher als vor einem Jahr."[34]
Nothing suggests that the variable 'loans' which positively influences the category 'monetary activity' is out-of-trend. Hence the statement is evaluated with '0' (Case A in Figure 1).

Next consider three examples for the category 'real activity'.

"*Die Investitionstätigkeit der Unternehmen hielt sich in den vergangenen Monaten auf hohem Niveau.*"[35]
The variable 'firm investments' is described to be on a high level which is sufficient to assign an out-of-trend mark. As the influence of firm investments on the category 'real activity' is positive the statement is evaluated with '1' (Case E in Figure 1).
"*Das verarbeitende Gewerbe hat seine Produktion in den ersten beiden Monaten*

[32] "Long-term deposits were much higher than usual." *Monthly Bulletin of the Bundesbank* (May 1975), p. 6.

[33] "The strong growth of the monetary quantity in June results more noticeably from a robust domestic credit expansion than in the previous months." *Monthly Bulletin of the Bundesbank* (August 1976), p. 7.

[34] "Overall, at the end of July 1970 loans to domestic non-banks were 12.8% higher than in the previous year." *Monthly Bulletin of the Bundesbank* (August 1970), p. 7.

[35] "The investment activity of enterprises stayed on a high level during the past months." *Monthly Bulletin of the Bundesbank* (December 1980), p. 6.

spürbar ausgeweitet."[36]
The positive change of the variable 'production in the manufacturing industries' is sizeable which turns the balance towards an out-of-trend mark. As the influence of the variable on the category is positive the statement is evaluated with '1' (Case E in Figure 1).
"*Die Produktion des produzierenden Gewerbes ist im September tendenziell leicht gesunken.*"[37]
A 'slight decrease' is not sufficient to assign an out-of-trend mark for the variable 'industrial production'. The statement is evaluated with '0' (Case A in Figure 1).

The following three statements are exemplary for the evaluation in the category 'foreign trade activity'.

"*In den hohen Auslandsbestellungen spiegelt sich die fortschreitende Konjunkturbelebung in wichtigen Industrieländern wieder.*"[38]
'Foreign export orders' are described to be high which is sufficient to assign an out-of-trend mark. As the influence of the variable on the category 'foreign trade activity' is positive the statement is evaluated with '1' (Case E in Figure 1).
"*Saisonbereinigt waren die Exporte (...) im Mai nach dem recht umsatzstarken Vormonat ausgesprochen schwach.*"[39] 'Exports' are described to be markedly weak which points in the direction of being below trend. As exports and foreign trade indicator are positively correlated the statement is evaluated with '-1' (Case C in Figure 1).
"*Schaltet man die Saisonschwankungen aus, so waren Aus- und Einfuhren gleichermaßen dem Wert nach um 1% höher als im Februar 1983.*"[40] The change of the variables 'exports' and 'imports' is not sizeable. Hence they are assumed to be in line with their trend. Both variables assessed are evaluated with '0' (Case A in Figure 1).

[36]"The manufacturing industries have noticeably expanded their production during the summer months." *Monthly Bulletin of the Bundesbank* (October 1996), p. 6.

[37]"Industrial production tended to decline slightly in September." *Monthly Bulletin of the Bundesbank* (November 1997), p. 10.

[38]"The high level of foreign export orders reflects the advancing economic recovery in important industrial countries." *Monthly Bulletin of the Bundesbank* (June 1976), p. 5.

[39]"After the quite top-selling previous month seasonally adjusted exports (...) were markedly weak in May." *Monthly Bulletin of the Bundesbank* (July 1978), p. 12.

[40]"After correcting for seasonal variations the values of imports and exports were 1% higher than in February 1983." *Monthly Bulletin of the Bundesbank* (May 1983), p. 15.

The next three examples are about the interpretation of assessments from the category 'fiscal activity'.

"*Demzufolge muss für 1980 auch mit einem weit höheren Gesamtdefizit der öffentlichen Haushalte gerechnet werden, als noch im Frühjahr erwartet worden war [...].*"[41] 'Public debt' is expected to be considerably above previous expectations which hints that the variable will be higher than normal in the future. Its influence on the category is positive and consequently the statement is evaluated with '1' (Case E in Figure 1).
"*Der vorangegangene Monat November war für den Bund [steuerlich] ein außerordentlich einnahmeschwacher Monat gewesen [...].*"[42] 'Inland revenues' are assessed to be 'extraordinarily weak' which hints that they are below trend. The influence of inland revenues on the category is negative. Consequently the statement is evaluated with '1' (Case B in Figure 1).
"*Auch im kommenden Jahr werden die staatlichen Defizite weiter steigen, aber sie werden voraussichtlich nicht die im Sommer des Jahres erwartete Größenordnung erreichen.*"[43] Nothing suggests that the variable 'public deficit' which positively influences the category 'fiscal activity' is out-of-trend. Hence the statement is evaluated with '0' (Case A in Figure 1).

The next three examples show the evaluation of statements from the category 'price activity'.

"*Die Zunahme der Außenhandels- und Leistungsbilanzüberschüsse [...] geht [...] ausschließlich auf die drastischen Rückgänge der Einfuhrpreise zurück.*"[44] 'Import prices' positively influence the category 'prices'. They have declined drastically which indicates that (part of) the category is below trend. The statement is evaluated with '-1' (Case C in Figure 1).

[41] "As a result one should expect a much higher overall public deficit than the deficit that was expected in spring." *Monthly Bulletin of the Bundesbank* (December 1980), p. 6.

[42] "Inland revenues in the previous month, November, were extraordinarily weak." *Monthly Bulletin of the Bundesbank* (January 1975), p. 9.

[43] "Public deficits will also rise in the forthcoming year but presumably they will not reach the magnitude that was expected in the summer of this year." *Monthly Bulletin of the Bundesbank* (December 1978), p. 6.

[44] "The growth of the surpluses in the foreign trade balance and the current account balance [...] can be attributed to a drastic decline in import prices." *Monthly Bulletin of the Bundesbank* (September 1986), p. 8. Note that this statement would also be evaluated in the category foreign trade activity because it assesses the variable "trade balance".

"*[...] das Problem der Inflationsbekämpfung [stellt sich] mehr denn je.*"[45] One can infer from this statement that inflation is considerably too high. This justifies an out-of-trend mark. As the variable is positively correlated with the category the statement is evaluated with '1' (Case E in Figure 1).
"*Die Einfuhrpreise sind im Mai saisonbereinigt wieder leicht gesunken.*"[46] One cannot infer that the variable 'import prices' is out-of-trend. The statement is evaluated with '0' (Case A in Figure 1).

[45]"The problem of fighting inflation is bigger than ever." *Monthly Bulletin of the Bundesbank* (February 1974), p. 6.

[46]"Seasonally adjusted import prices again slightly decreased in May." *Monthly Bulletin of the Bundesbank* (July 1996), p. 14.

Appendix B: Assessment Indicators, Mean Values, and Number of Assessed Statements

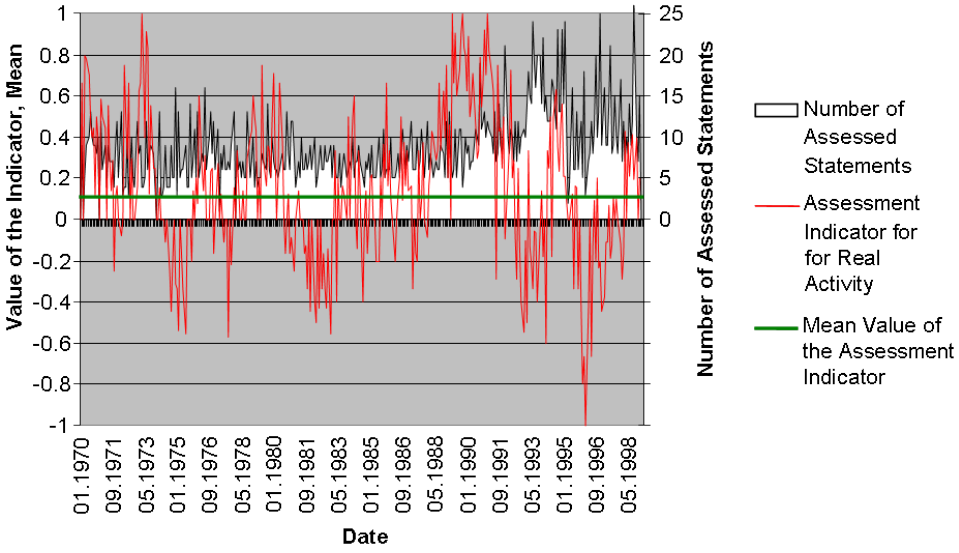

Figure 5: Assessment Indicator for Real Activity

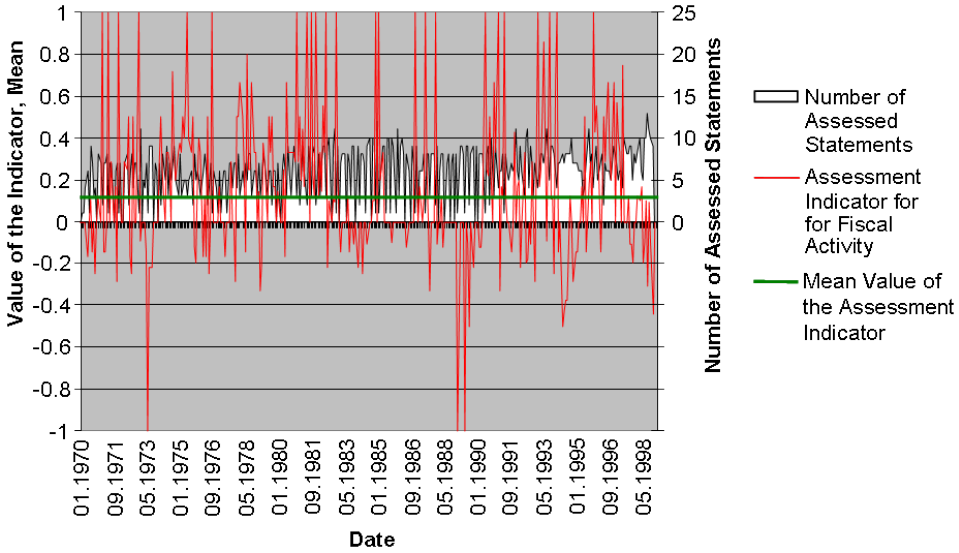

Figure 6: Assessment Indicator for Fiscal Activity

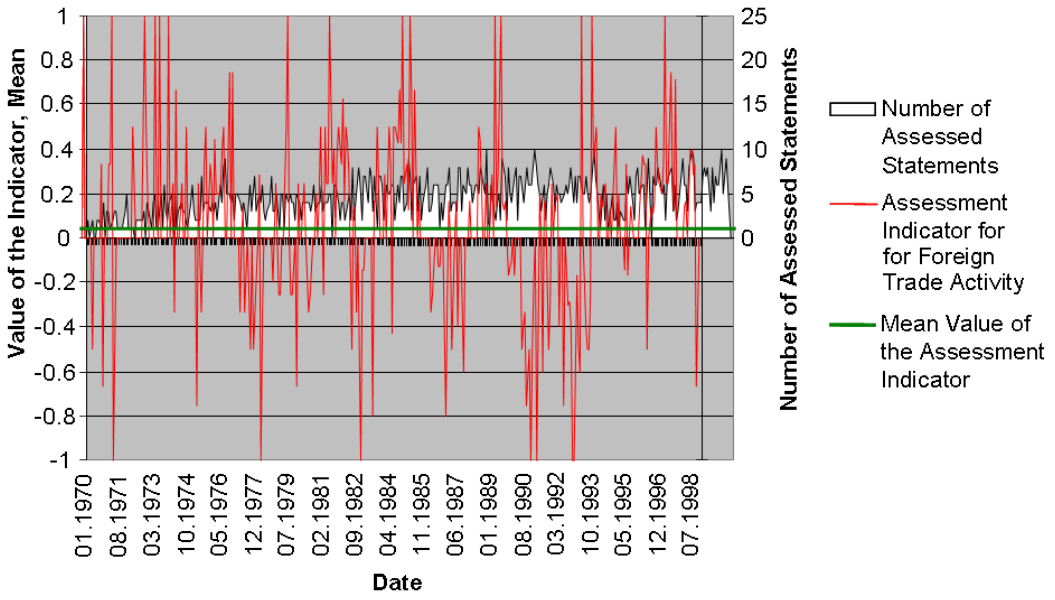

Figure 7: Assessment Indicator for Foreign Trade Activity

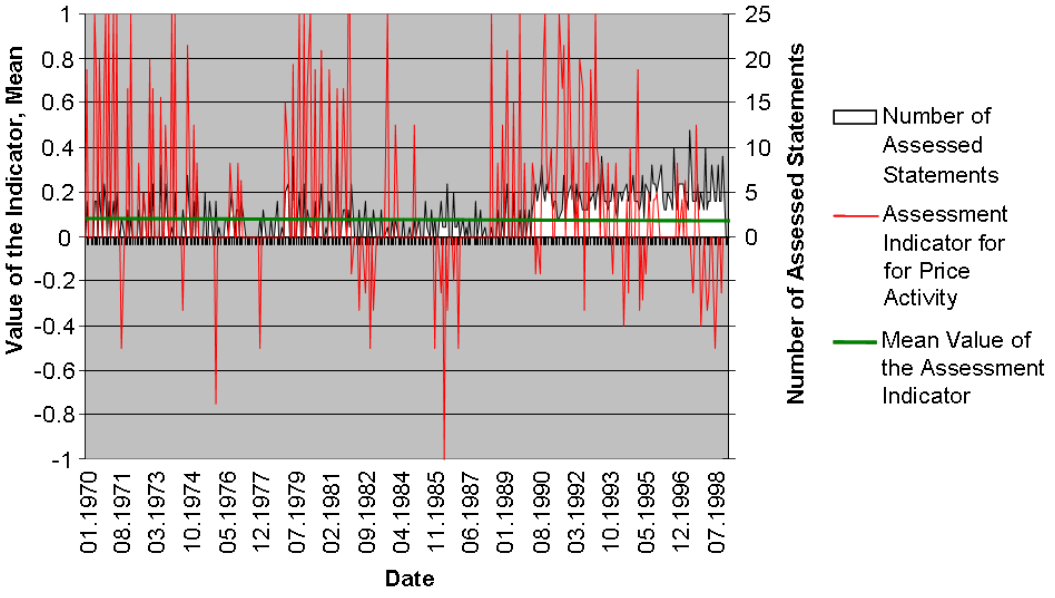

Figure 8: Assessment Indicator for Price Activity

Appendix C: Testing for Structural Breaks

The following description is based on Bai and Perron (1998). In this application estimation is done within a pure structural change model, that is, all coefficients are subject to shifts.

Consider the linear regression with m breakpoints, that is m+1 regimes:

$$y_t = \boldsymbol{z}_t' \boldsymbol{\delta}_j + u_t \tag{3}$$

where $j = 1, ..., m+1$, $t = T_{j-1} + 1, ..., T_j$, $min(t) = h$, $T_0 = 0$, $T_{m+1} = T$, h denotes the minimal length of a regime, y_t is the dependent variable, $\boldsymbol{z}_t$ are the independent variables, $\boldsymbol{\delta}_j$ is a vector of coefficients, and u_t is an error term.

The following procedure estimates the unknown regression coefficients $\hat{\boldsymbol{\delta}}_j$ as well as the optimal position of the breakpoints $\hat{T}_j$. For each possible segment $(T_{j-1} + 1, ..., T_j)$, denoted $\{T_j\}$, the corresponding least squares estimates of $\boldsymbol{\delta_j}$ are obtained by minimizing the sum of squared residuals $\sum_{i=1}^{m+1} \sum_{t=T_{i-1}+1}^{T_i} [y_t - \boldsymbol{z}_t' \boldsymbol{\delta}_i]^2$. Let $\hat{\boldsymbol{\delta}}(\{T_j\})$ denote the resulting estimates. Using the corresponding sum of squared residuals, denoted by $S_T(T_1, ..., T_m)$, for the $\hat{\boldsymbol{\delta}}(\{T_j\})$, the estimated breakpoints $(\hat{T_1}, ..., \hat{T_m})$ are such that $(\hat{T_1}, ..., \hat{T_m}) = argmin_{T_1,...,T_m} S_T(T_1, ..., T_m)$.

In a nutshell, given the number of breakpoints m and the minimal length of a segment h, the procedure calculates the global sum of squared residuals for all possible positions of the breakpoints. The selected breakpoints are such that the sum of squared residuals over all segments is minimized. The $\hat{\boldsymbol{\delta}}(T_j)$ chosen are the corresponding coefficient estimates at the selected breakdates $\hat{\boldsymbol{\delta}}(\hat{T_j})$.

The maximum number of breakpoints m is determined by h: $m = \theta - 1$ where θ is rounded to the nearest integer less or equal to $\frac{T}{h}$. To determine the optimal number of breakpoints one applies the above procedure for m=0, ..., $\theta - 1$. The optimal number of breakpoints chosen is the one that yields the smallest value of the Bayesian Information Criterion (BIC) defined as

$$BIC(m) = ln\ \hat{\sigma}^2(m) + [(m+1)q + m] \frac{ln\ T}{T}, \tag{4}$$

where q is the number of independent variables.

Bai and Perron (1998) do not give clear guidance how to choose the parameter h which influences the position of selected breakpoints. When choosing h too small, one ends up estimating for some segments with very few observations. However, in their application they always choose it to be in a range between 10% and 25% of all observations. The value of h chosen

in this application is 48 observations, that is, a minimum sample size of four years, which is between 14% and 17% of T, depending on the period of analysis. Note that the chosen value of h does not allow the inclusion of the breakdown of the Bretton Woods system as a breakpoint in the analysis covering data from January 1970 to December 1998.[47]

According to Bai and Perron (1998) the BIC performs reasonably well when no serial correlation is present in the errors. In all estimations, tests provided no evidence of serial correlation.[48]

[47] In the range of h=30 to 38 the beginning of 1973 is always a chosen breakpoint, however, this number of observations is considered too small to estimate six coefficients and several potential breakpoints. In the range h=39 to h=63, March 1975 is always the selected breakpoint.

[48] Durbin's alternative test for serial correlation, Stata (2005).

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